

**Determining Transuranic Alpha Activity Concentration
for Compliance with the
Nevada Test Site Waste Acceptance Criteria**

Revision 0

May 10, 2006

**Approved By:
U.S. Department of Energy
National Nuclear Security Administration
Nevada Site Office (NNSA/NSO)**

Original Signed by Gary Pyles
Gary Pyles, NNSA/NSO RWAP Task Lead

05/17/2006
Date

**Prepared By:
Bechtel Nevada, Radioactive Waste Acceptance Program (RWAP)**

Original Signed by Deron Linkenheil
Deron Linkenheil, Senior Engineer, CHP

05/17/2006
Date

Original Signed by Michael McKinnon
Michael McKinnon, Senior Engineer, PE, CHP

05/17/2006
Date

Original Signed by James "Bruno" Zovi
James "Bruno" Zovi, RWAP Manager

05/17/2006
Date

Determining Transuranic Alpha Activity Concentration for Compliance with the Nevada Test Site Waste Acceptance Criteria

The purpose of this paper is to provide clarification on determining the transuranic (TRU) alpha concentration of low-level radioactive waste (LLW) for compliance with Section 3.1.1, Transuranics, of the Nevada Test Site Waste Acceptance Criteria (NTSWAC), DOE/NV--325-Rev. 6, and to ensure correlation with DOE/WIPP-02-3122, "Contact-Handled Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant" (CH-WAC), Revision 4, Effective Date: December 29, 2005.

The U.S. Department of Energy (DOE), National Nuclear Security Administration Nevada Site Office (NNSA/NSO) uses a graded approach in its acceptance of waste characterization methods as described in Appendix E, "Radiological Waste Characterization and Reporting Requirements," of the NTSWAC. For example, measurement of the TRU activity with a confidence level has been accepted as demonstrating compliance with Section 3.1.1, Transuranics, of the NTSWAC (i.e., TRU waste criteria). However, the CH-WAC does not require a statistical confidence level in determining the TRU alpha concentration if the assay process is certified by the Carlsbad Field Office (CBFO). This difference has created a radioactive waste group without a disposal path. DOE radioactive waste management policy (DOE Order 435.1) and the CH-WAC were reviewed to clarify the NTSWAC for determining the TRU alpha concentration of LLW.

LLW is defined by what it is not. The DOE policy for managing radioactive waste is found in DOE Order 435.1, Change 1, "Radioactive Waste Management." DOE G 435.1-1, "Implementation Guide for use with DOE M 435.1-1, Chapter IV, Low-Level Waste Requirements," defines LLW as follows:

"Low-level radioactive waste is radioactive waste that is not high-level radioactive waste, spent nuclear fuel, transuranic waste, byproduct material (as defined in section 11e.(2) of the *Atomic Energy Act of 1954*, as amended) or naturally occurring radioactive material."

DOE G 435.1-1, "Implementation Guide for use with DOE M 435.1-1, Chapter III, Transuranic Waste Requirements," states the following:

"Determining whether waste exceeds the 100 nCi/g (3700 Bq/g) shall be in accordance with the requirements and guidance issued by the Carlsbad Area Office in the *Transuranic Waste Characterization Quality Assurance Program Plan, Waste Acceptance Criteria for the Waste Isolation Pilot Plant*, and/or other controlling documents. Waste which does not exceed the 100 nCi/g limit is to be managed in accordance with the low-level waste requirements of DOE M 435.1-1."

CH-WAC, Section 3.3, Radiological Properties, states in part:

The first group indicates the activities and masses of the ten WIPP-tracked radionuclides (i.e., Am-241, Pu-238, Pu-239, Pu-240, Pu-242, U-233, U-234, U-238, Sr-90, and Cs-137) and the TRU alpha activity concentration (i.e., >100 nCi/g of alpha-emitting TRU isotopes with half lives greater than 20 years) of the waste. This set of radiological properties is regulated by the U.S. Environmental Protection Agency (EPA) in accordance with 40 CFR Parts 191 and 194 (references 27 and 16). Estimates of their activities and masses shall be derived from a system of controls certified by CBFO that includes acceptable knowledge (AK), computations, measurements, sampling, etc. (reference 17, appendix Waste Component Limits, WCL). Appendix A provides the methods and requirements by which to characterize the radiological composition of the contact-handled TRU (CH-TRU) waste utilizing radioassay techniques.

Section 3.3.3, TRU Alpha Activity Concentration, states in part:

Acceptance Criterion. TRU waste payload containers shall contain more than 100 nCi/g of alpha-emitting TRU isotopes with half-lives greater than 20 years. Without taking into consideration Total Measurement Uncertainty (TMU), the TRU alpha activity concentration for a payload container is determined by dividing the TRU alpha activity of the waste by the weight of the waste. . . The TRU alpha activity concentration shall be reported to the WIPP Waste Information System (WWIS); however, there are no reporting requirements for its associated TMU.

Based on the above, NNSA/NSO will evaluate and accept the determination of TRU alpha concentration of LLW as follows:

The TRU alpha activity concentration shall be determined in accordance with the CH-WAC. Total measurement uncertainty is not required to be added to the TRU alpha activity concentration (i.e., Statistical level of confidence is not applicable). Estimates of the activities and masses shall be derived from a system of controls certified by CBFO that includes acceptable knowledge (process knowledge), computations, measurements, sampling, etc.

For waste generators that do not have CBFO certification of the assay process, equivalent practices for determining the TRU alpha activity concentration will be considered by NNSA/NSO for acceptance (e.g., acceptable level of certainty of 90%, review of acceptable knowledge, use of lower limit of detection values, graded approach, assay systems validated by known standards, etc.).